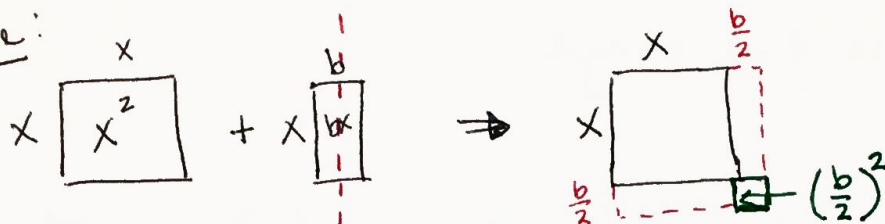


Notes - Solving by Completing the Square

⇒ Turns standard form into vertex form

⇒ Need $x^2 + bx =$
a=1 c moved to other side

Picture:



Algebra Process

1. Make sure you have $x^2 + bx =$

2. Find $b/2$

3. Square $b/2$

4. Add the result to both sides of equation

$$(x + \frac{b}{2})^2 =$$

Ex 1:

$$x^2 - 8x = -15$$

step 4:

$$x^2 - 8x + 16 = 1$$

$$\sqrt{(x - 4)^2} = \sqrt{1}$$

$$x - 4 = \pm 1$$

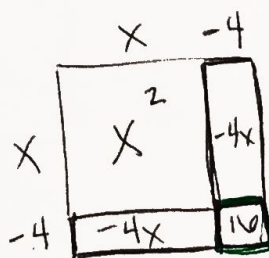
$$+4 \quad +4$$

$$x = 1 + 4 = 5$$

$$x = -1 + 4 = 3$$

step 2: $\frac{b}{2} = \frac{-8}{2} = -4$

step 3: $(-4)^2 = 16$



$$(5, 0) \quad (3, 0)$$

$$\text{Ex 2: } \begin{array}{r} x^2 + 2x - 120 = 0 \\ +120 \quad +120 \\ \hline \end{array}$$

$$\text{Step 1: } x^2 + 2x = 120$$

$$\text{Step 4: } \begin{array}{r} +1 \quad +1 \\ \hline \end{array}$$

$$x^2 + 2x + 1 = 121$$

$$\sqrt{(x+1)^2} = \sqrt{121}$$

$$x+1 = \pm 11$$

$$\Rightarrow \begin{array}{l} x+1 = 11 \\ x+1 = -11 \end{array}$$

$$\begin{array}{l} x = 10 \\ x = -12 \end{array}$$

$$\left(x + \frac{b}{2}\right)^2$$

$$\text{Ex 3: } \begin{array}{r} 2x^2 - 3x + 1 = 0 \\ -1 \quad -1 \\ \hline \end{array}$$

$$\frac{2x^2}{2} - \frac{3x}{2} = -\frac{1}{2}$$

$$\text{Step 1: } x^2 - \frac{3}{2}x = -\frac{1}{2}$$

$$\text{Step 4: } \begin{array}{r} \phantom{x^2 - \frac{3}{2}x} + \frac{9}{16} \quad + \frac{9}{16} \\ \hline \end{array}$$

$$x^2 - \frac{3}{2}x + \frac{9}{16} = \frac{1}{16}$$

$$\begin{array}{l} (x + \frac{b}{2})^2 \\ \sqrt{\left(x - \frac{3}{4}\right)^2} = \sqrt{\frac{1}{16}} \end{array}$$

$$x - \frac{3}{4} = \pm \frac{1}{4}$$

$$x - \frac{3}{4} = \frac{1}{4}$$

$$x = 1$$

$$x - \frac{3}{4} = -\frac{1}{4}$$

$$x = \frac{1}{2}$$

$$\text{Step 2: } \frac{b}{2} = \frac{-3}{2} \cdot \frac{1}{2} = -\frac{3}{4}$$

$$\text{Step 3: } \left(-\frac{3}{4}\right)^2 = \frac{9}{16}$$

$$\begin{array}{l} -\frac{1}{2} \\ -\frac{8}{16} + \frac{9}{16} = \frac{1}{16} \end{array}$$